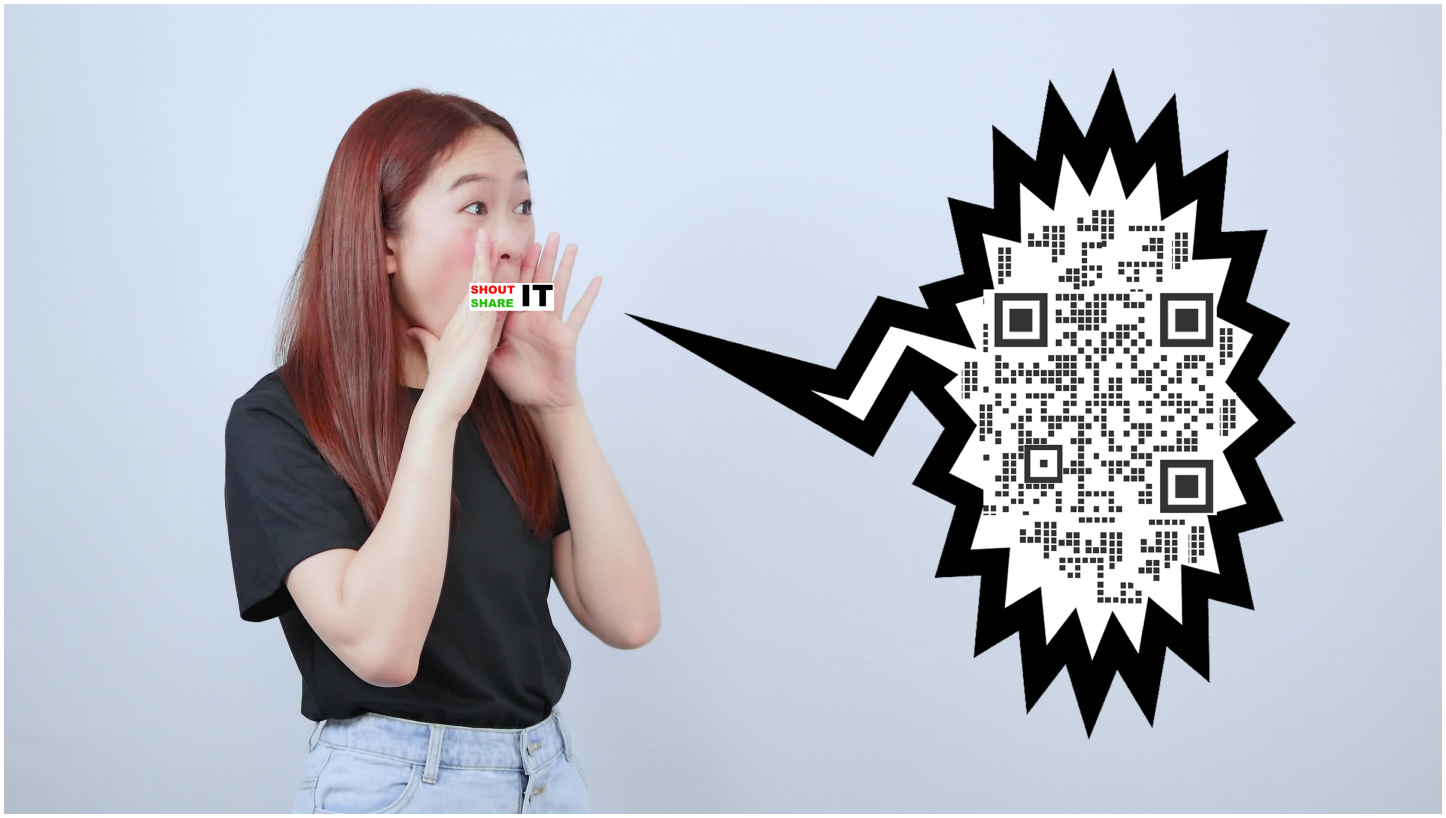
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THE TENT CATER-PILLAR

BY

CLARENCE M. WEED

The caterpillars lay their eggs on the branches of apple trees, and being hatched by the warmth of the spring, they form clusters, and inclose themselves in a web, whence they issue forth in quest of food, and destroy the leaves of this and other trees.—Jeremy Belknap, History of New Hampshire, 1792.

NEW HAMPSHIRE COLLEGE

AGRICULTURAL EXPERIMENT STATION

DURHAM

Bulletin 38 **August, 1896**

These pernicious pests spread in every direction from the trees of the careless and the indolent to those of their more careful and industrious neighbors, whose labors are thereby greatly increased, and have to be followed up year after year without any prospect of permanent relief.—T. W. Harris, 1841.

A Wild Cherry Tree in "The Leafy Month of June"

There is certainly no justice or reason for permitting a few or many men in a community to shield and shelter insects that will soon swarm over the grounds of neighbors, but as nothing less than the severe lash of the law will reach the stolidly indifferent in such matters, we are forced to submit and fight these enemies as they invade our gardens and orchards.—Andrew S. Fuller, 1893.

THE TENT CATERPILLAR

BY CLARENCE M. WEED

MONG the many insect pests of the Granite State none is more in evidence during spring and early summer than the Tent Caterpillar,* which for more than a century has ravaged the orchards of New England. In 1790 Samuel Dean wrote from Portland, Mass.: "The principal inconvenience the farmer meets with from caterpillars is the damage they do to his orchard. A hairy kind of caterpillars build their nests on apple trees in May, and are gone entirely in June. But they feed so industriously on the leaves as to destroy a great part of them if they be not timely prevented. As they are far less mischievous than the canker-worm, so they are more easily subdued."†

Fifty years later Dr. T. W. Harris, of Cambridge, Mass., wrote of "the caterpillars that swarm in the unpruned nurseries and neglected orchards of the slovenly and improvident husbandman, and hang their many coated webs upon the wild cherry trees that are suffered to spring up unchecked by the wayside, and encroach upon the borders of pastures and fields." During recent years these insects have also been very abundant, and have often defoliated orchards, either alone or with the assistance of the canker worm.

Apparently, many people do not realize the seriousness of

**Clisiocampa americana.*

† New England Farmer or Georgical Dictionary, 1790, p. 41.

the injury when a fruit tree is stripped of its leaves. In its effort to repair the damage the tree will put out new foliage, thereby using up the stored materials that otherwise would be utilized for growth or fruit. Even in case no blossoms appear the season the damage is done, so that no loss of fruit that year may be felt, the effects will be evident in next year's crop. The preservation of the leaves in wholeness and health is necessary to the preservation of the tree in a profitable condition; the orchardist cannot afford to have the leaves removed or injured.

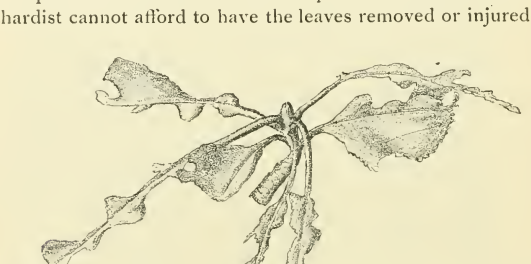


FIG. 3.—Apple Leaves eaten by Tent Caterpillars (Original)

The injury done by the tent caterpillar is at once distinguished from that of the canker worm by the fact that the former eats the body of the leaf, veins and all, leaving only the midrib or larger veins (Fig. 3), while the canker worm feeds upon the surface of the leaf, leaving the brown network of veins. A severe attack of the tent caterpillar renders the tree almost as bare in June as it is in mid-winter—a condition shown in the illustration on the second page of this bulletin—while a similar attack by the canker worm gives the tree a brown appearance, somewhat as if it had been scorched by fire.

FIG. 4. Egg-Mass (Original)

FEW insects pass so long a portion of the year within the eggs as do the Tent Caterpillars. In July the eggs are laid in masses of 200 or more in a cylindrical cluster upon the twigs of apple and wild cherry. After they are deposited the parent moth covers them with a viscid liquid, which dries into a sort of varnish that completely coats them, as represented in Fig. 4. The insect remains in this egg state from July until the following spring, when the little caterpillars emerge from the eggs and begin feeding upon the tender foliage of the buds about them. In a few days they begin to make a silken tent, utilizing generally, for this purpose, a fork of the branch. As time goes on the nest is enlarged. The caterpillars retire to the tent at night, and during cold and wet weather, and when not feeding. They have regular times for their meals, leaving and returning to the nest in processions. They become full grown in about six weeks, being extremely voracious during the latter part of their development. They are then nearly two inches long, with a hairy body, ornamented with a distinct white stripe along the middle of the back, on each side of which are numerous short, yellow, longitudinal lines, rather irregularly arranged. The sides are partially covered with paler lines, spotted and streaked with blue, while the lower surface of the body is black. The full-grown caterpillar is represented in Fig. 5.

When the caterpillars become full grown most of them leave the tree where they have developed, and crawl about in search of shelter. Early in June thousands of these caterpillars may be seen rapidly crawling along the ground, especially by the

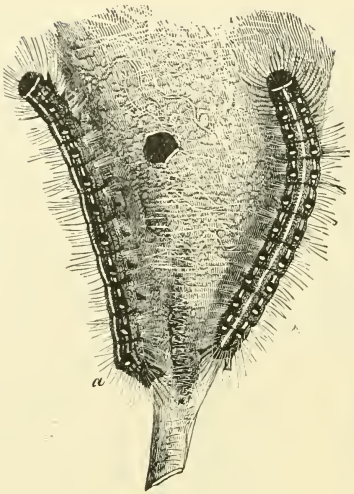


FIG. 5.—Tent Caterpillar (After Riley)

roadside. When they find a satisfactory situation, beneath a board, in the cracks of a fence, or between pieces of rough bark, they spin an oval, silken cocoon (Fig. 6), yellow when completed, within which they change to the quiet pupa or chrysalis state.

FIG. 6.—Cocoon of Tent Caterpillar (Original)

Two or three weeks later another change takes place, and from each cocoon there comes forth a reddish-brown moth (Fig. 7). The male moths are considerably smaller than the females. These moths are nocturnal, flying only at night, and are to be found throughout the greater part of July. The females deposit the eggs upon the twigs of trees and soon die. As already stated, these eggs remain unhatched until the following spring.

FIG. 7.—Female Moth (After Riley)

THE EXTENDING RANGE OF FOOD PLANTS

The ordinary food-plants of the tent caterpillar are the apple and the various kinds of wild cherry. The moths apparently choose these in preference to all other trees for the reception of the egg-masses. But during the outbreaks of the insect in New England the last few years, as in fact in previous outbreaks in other regions, many of the caterpillars have been forced by hunger to attack the foliage of other trees and shrubs. In many localities the leaves of the apple and cherry trees upon which the insects fed when first hatched, have been wholly devoured before the caterpillars were half grown. Of course this must be the result when more egg-masses are laid upon a tree or shrub than can be matured upon its leaves. Thus threatened by starvation the caterpillars have been forced to leave their nests, descend to the ground, and crawl about in search of food. Many of them ascend the nearest trees and shrubs, and nibble at their leaves. If these leaves are not too distasteful the caterpillars are likely to remain and complete their growth upon the new food-plant thus found. If the insects are unable to live upon the leaves they are likely again to crawl away in quest of something better. Doubtless thousands of them perish outright in this search for food, while myriads of others prematurely change to pupæ, and either die before maturing into moths, or develop into feeble adults.

But it is very probable that many of these caterpillars which are able to complete their larval growth upon new food plants

will survive all vicissitudes and mature into moths that apparently are likely to deposit eggs upon the variety of tree that has furnished them food. In this way the insect will be likely soon greatly to extend the limits of its food-supply, and become much more difficult to subdue than it now is. The case is suggestive of the famous Gypsy Moth that has lately been causing such alarm in Massachusetts. The unusual noxiousness of this

FIG. 8.—Oak Tree partially defoliated by Tent Caterpillars (Original)

pest arises from the ability of the caterpillars to feed upon leaves of all sorts—hard wood trees, evergreens, shrubs, and herbaceous plants. Therein lies its menace; and if the tent caterpillar is permitted to continue establishing itself upon new food plants, our descendants may have a somewhat similar pest to contend with.

That this is not an imaginary danger can be seen from Fig. 8, and from other photographs which we took but have not reproduced in this bulletin, showing the work of the tent caterpillar upon trees and shrubs not on its usual bill of fare. And the most suggestive fact in connection with these changes of food is to be found in the great dissimilarity of the other food plants. The apple and cherry belong to the great rose family of plants; botanically speaking they are related to each other as well as to the rose, the peach, the pear, the plum, the mountain ash, and others. It is well known that insects have family preferences in the matter of food; that if a given insect feeds upon a given plant we need not be surprised to find it also upon another plant closely related, belonging to the same family.

FIG. 9—Diseased Tent Caterpillars (Original)

In view of this we should expect the tent caterpillar when it was forced to increase its range of food to attack the peach, cultivated cherry, rose, and other plants of this family. This has been done, and each of these is now on the tent caterpillar's food list, but we have also found it feeding freely and apparently thriving upon such widely separated plants—so far as botanical kinship is concerned—as the oaks (Fig. 8), the hickories, the birches, (see photograph on title page,) the barberry, and the willows and poplars. I found a large tent even upon the low evergreen known as the juniper, but the caterpillars from it evidently fed upon a neighboring barberry.

During the latter part of the caterpillar season one can frequently find dead and dying caterpillars upon the outside of the tent, stretched at full length. Some of these will be simply sluggish, others evidently nearly dead, others dead and rupturing at a touch, letting escape the liquid decomposed body contents. Some will be hanging by one end of the body to the tent or twig, as shown in Fig. 9. These caterpillars appear to be affected by one of the bacterial diseases that are known to develop in many insect larvæ when they become very abundant. The army worm and common cabbage worm are frequently destroyed in great numbers by such diseases. While there appeared to be more of these diseased larvæ this year than last in southern New Hampshire, the disease was not sufficiently destructive to give great hope for the immediate suppression of the outbreak. The fact of each colony being somewhat isolated from others will tend to prevent the germs from affecting all the caterpillars of a region.

After the tent caterpillars are half grown there may be found in many of the nests small dead specimens with the body swollen and the skin dry and hard. (Fig. 10). If these are placed in bottles by themselves, a fortnight or so later small four-winged flies will emerge from them. These are parasitic ichneumon flies. They have developed from eggs placed in the young caterpillars by similar parent flies. The eggs hatched into grubs or larvæ that developed on the inside of the caterpillars, killing them and absorbing all the bodies except the skin. Within the latter the larvæ pupated, to emerge later as flies. We reared many of these parasites, which were kindly determined by Mr. L. O. Howard as *Pimpla inquisitor*.

FIG. 10—Parasitized Caterpillar (Original)

Comparatively few birds feed upon hairy larvæ like the tent caterpillar, but some, like the cuckoos and blue jays, devour them eagerly. The European cuckoo is said to regurgitate the mass of hairy skins swallowed with the caterpillars, and probably our species have the same habit. Many observers have noticed that both the Black-billed and the Yellow-billed Cuckoos

feed upon the tent caterpillars. For example, Mr. C. E. Bailey states: * "On May 10 a Black-billed Cuckoo came into a tree near me at 3 P. M., and sat there until 4:40 P. M., then he went straight to a tent caterpillar's nest. He looked it over for a short time, and then commenced eating the caterpillars. He picked twenty-seven caterpillars out of the nest before he stopped. The bird ate them all and did not drop one."

Mr. E. H. Forbush gives* the following list of birds found

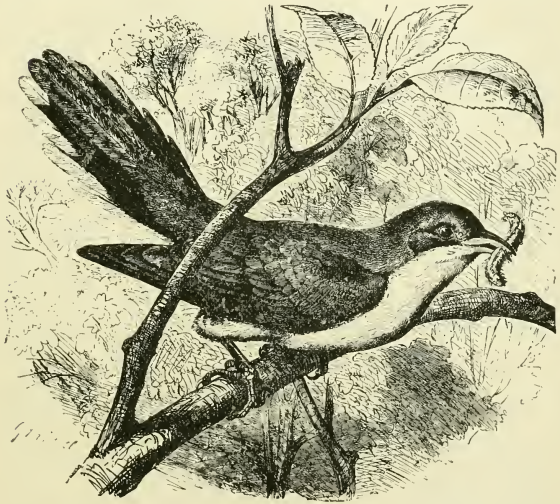


FIG. 11.—Yellow-billed Cuckoo (After Brehm)

feeding on tent caterpillars in a Massachusetts orchard in 1895: Crow, Chickadee, Baltimore Oriole, Red-eyed Vireo, Yellow-billed Cuckoo, Black-billed Cuckoo, Chipping Sparrow, Yellow Warbler. Other birds have also occasionally been reported to feed upon these pests, but birds do not do so much toward their destruction as they do toward the destruction of the canker-worm, the latter being a much more edible insect.

My observations upon the natural checks upon the tent cater-

* Mass. Crop Report, July, 1895, p. 29

pillar lead me to believe that it is not good policy to depend upon them for subduing the pests. It will be much better for the intelligent people of each community to attempt to arouse public opinion so that each man will destroy the caterpillars upon his own premises and along the adjoining roadsides.

METHODS OF DESTROYING TENT CATERPILLARS

The tent caterpillar is open to attack in a variety of ways, and should by no means be allowed to injure orchards and disfigure the roadsides as it has been doing recently. Beginning with the eggs the principal remedial measures may be summarized as follows:

1. *Destroying the Eggs.*—During winter and early spring the egg masses may readily be seen upon the smaller branches, and are easily removed and burned. In this work boys may be employed to advantage; their sharp eyes and nimble limbs are likely to accomplish as much as their elders. A few winters since a society in a Massachusetts town offered prizes to the youngsters of the community for the collection of the tent caterpillar egg-masses, and thousands were thus destroyed. The same result may to a large extent be accomplished by cutting off and burning the thickets of wild cherry that line the roadsides, and stand in clusters in pastures and fields. This should be done after the eggs are laid, and before they are hatched—any time between September 1st and April 1st would do. If in a given community the eggs on these wild cherries were thus destroyed the next season's crop of worms would be greatly lessened, and attention could be concentrated on the tents in the orchards. Such a burning of the wild cherry would also destroy millions of spores of black knot—the fungous disease that is always threatening cultivated plums and cherries because of its almost universal presence on the wild cherries. The pest-breeding, neglected apple trees bearing natural fruit, so often seen along the roadside, should also be converted into firewood, and the branches burned during fall or winter.

2. *Killing the Young Caterpillars.*—When the caterpillars are young and the nests are small, it is easy to destroy the

colony by swabbing it out of the crotch with a mass of rags, a gloved hand, a forked stick, a scrubbing brush, or almost anything that can be used to crush the tiny worms huddled beneath the tent. Of course this destruction should take place when the caterpillars are at home rather than when they are abroad on the branches feeding. In rainy weather one can generally find them in the tent almost any time, while in fair weather they may be attacked either early or late in the day. The colony can also be removed by taking hold of the outside of the tent with the hand and lifting it with the worms inside: then drop it to the ground and step on it. When the tent is on a small branch the latter may be cut off and then burned or crushed. "A slender pole long enough to reach the highest nest in the tree," writes Mr. A. S. Fuller, "with two or three shingle nails driven through the end, leaving the heads sticking out a half inch, makes a very handy and efficient implement for dislodging the nest and caterpillars. By thrusting the end into the tent and then twisting it around two or three times the tent will be rolled about the end and can be drawn forth with contents," and destroyed.

There appears to be a considerable variation in the time of hatching of the different egg-masses, so that it is often necessary to go over the trees more than once to get all the nests. As a rule one should not be satisfied with a single attack upon the pests, but should renew the battle if necessary.

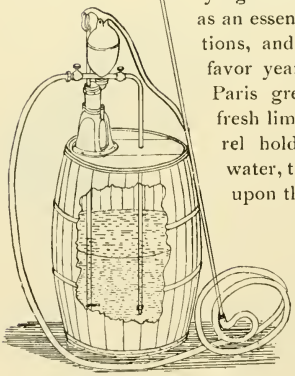
3. *Burning with Torches.*—A rather common method of destroying tent caterpillars is to burn them out by means of some substance saturated with kerosene. An asbestos torch advertised by the seedsmen and implement dealers for this purpose is represented in Fig. 12. The asbestos is saturated with kerosene, lighted and held under the tents for the cremation of the caterpillars. Rags tied to the end of a pole and satu-

FIG. 12.—Asbestos Torch

rated with kerosene are also used, as well as various other devices. But burning is a remedy which is likely to cause more harm than good. It may not injure the tree much, but one is always tempted to use it on the larger branches where the bark is very likely to be seriously damaged. I have seen a fine young apple tree killed by the use of a torch on its tent caterpillars, and have known many larger trees to be seriously injured in the same way.

4. *Spraying with the Arsenites.*—On many accounts there is no more satisfactory method of subduing the tent caterpillar in the orchard than by spraying with Paris green or London purple mixed with water. Not only is this pretty certain to kill off all the young caterpillars on the trees, but it also destroys canker worms and also other leaf-eating caterpillars as well as the larvæ of the Codling Moth or Apple Worm, discussed in Bulletin 35 of this Station.

Fig. 13



Fortunately spraying has been adopted by a great many commercial fruit-growers as an essential part of the season's operations, and the practice is growing in favor yearly. Four or five ounces of Paris green, with a pint or two of fresh lime water, are added to a barrel holding forty or fifty gallons of water, thoroughly mixed and sprayed upon the trees soon after the worms hatch, by means of a force pump and spray nozzle. A simple and effective spraying outfit, which has been used to good advantage in the experiments at this Station, is represented in Fig.

13. It consists of a kerosene barrel holding fifty gallons, a force pump having a double discharge, with a short line of hose running into the barrel to keep the liquid stirred, and a long line of hose fitted at the end to a slender brass rod tipped with a spray nozzle. This outfit can be obtained through any hardware dealer, or direct from any of the numerous manufacturers of spraying machinery.

FIG. 14.—Tent Caterpillar on Oak (Original)

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